

## Abstract

A method and an apparatus are provided in this invention to select an optimal swapping technique in discrete multi-tone system. The algorithm for performing gain-swapping is also proposed in the present invention. A swapping technique is  
5 selected from gain-swapping and a combination of bit-swapping and gain-swapping based on two index values such that the difference between the maximum mean square error ( $MSE_{max}$ ) and the minimum mean square error ( $MSE_{min}$ ) is minimized and the gain factor constraints are met. The first index value I is representative of range of improvement when adopting the gain-swapping as the swapping technique,  
10 and the second index value J is representative of range of improvement when adopting a combination of the gain-swapping and the bit-swapping as the swapping technique.

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